Docket Nos. 2019-224-E
and 2019-225-E

DIRECT TESTIMONY OF KEVIN LUCAS
ON BEHALF OF
THE SOUTH CAROLINA SOLAR BUSINESS ALLIANCE

EXHIBIT KL-1

KEVIN M. LUCAS

SOLAR ENERGY INDUSTRIES ASSOCIATION

Mr. Lucas is Senior Director of Utility Policy and Regulation for the Solar Energy Industries Association (SEIA). SEIA is the national trade association for the U.S. solar industry. SEIA is leading the transformation to a clean energy economy, creating the framework for solar to achieve 20% of U.S. electricity generation by 2030. SEIA works with its 1,000 member companies and other strategic partners to fight for policies that create jobs in every community and shape fair market rules that promote competition and the growth of reliable, low-cost solar power.

Since 2010, Mr. Lucas has worked in the energy and environment industry focusing on renewable energy, energy efficiency, and greenhouse gas reduction. In his role at SEIA, Mr. Lucas develops expert witness testimony for rate cases, integrated resource plans, and other regulatory proceedings. He has also been actively involved in the ongoing New York Reforming the Energy Vision docket, focusing on distributed energy resource valuation and rate design. Prior to joining SEIA, Mr. Lucas worked for the Alliance to Save Energy, a Washington DC-based nonprofit focused on reducing energy use in the built environment. Before the Alliance, he worked for the Maryland Energy Administration, the state energy office, on numerous legislative and regulatory issues and developed and presented testimony before the Maryland General Assembly and the Maryland Public Service Commission.

Prior to entering the energy and environment field, Mr. Lucas was a manager at Accenture, a leading consulting firm. Mr. Lucas implemented enterprise resource planning software for Fortune 500 companies in industries such as consumer electronics, oil and gas, and manufacturing.

AREAS OF EXPERTISE

- Renewable Energy Policy Analysis: extensive experience analyzing renewable energy policy issues and communicating results to both expert and general audiences.
- Energy Efficiency Policy Analysis: detailed understanding of energy efficiency policies, including the development of potential studies and utility efficiency program design and implementation.
- Quantitative Analysis: deep expertise in quantitative analysis across a broad range of topics including analyzing financial and operational data sets, constructing models to explore electricity industry data, and incorporating original analysis into expert witness testimony.
- Energy Markets: studies interaction of renewable energy and energy efficiency policies with wholesale market operation and price impacts.
- Legislative Analysis: reviews legislation related to energy issues to discern potential impacts on markets, utilities, and customers.

EDUCATION

Mr. Lucas holds a Masters of Business Administration from the University of North Carolina, Kenan-Flagler Business School (2009) and a Bachelor of Science in Engineering, Mechanical Engineering from Princeton University (1998).

ACADEMIC HONORS

- Beta Gamma Sigma Honor Society
- Paul Fulton Fellowship, Kenan-Flagler Business School
- Graduated *cum laude* from Princeton University

KEVIN M. LUCAS

SOLAR ENERGY INDUSTRIES ASSOCIATION

EXPERT WITNESS TESTIMONY

Arizona Corporation Commission

- Docket No. E-01345A-19-0236 **-** *In the Matter of the Application of Arizona Public Service Company for a Hearing to Determine the Fair Value of the Utility Property of the Company for Ratemaking Purposes, to Fix a Just and Reasonable Rate of Return Thereon, to Approve Rate Schedules Designed to Develop Such Return.*
    - Analyzing and modifying APS's class cost of service study, arguing for changes to time of use rate design, proposing new rate designs for solar plus storage installations, proposing improvements to non-residential rate designs, advocating for a "bring your own device" program.

Public Utilities Commission of the State of Colorado

- Docket 17A-0797E – *Public Service Company - Accelerated Depreciation - AD/RR*
    - Advocating for appropriate structure to utilize renewable energy funds to support the early retirement of coal facilities and to continue to support distributed resources
- Docket 19A-0369E – *In the Matter of The Application of Public Service Company of Colorado For Approval of Its 2020-2021 Renewable Energy Compliance Plan*
    - Advocating for changes to better support solar and solar plus storage installations
- Docket 19AL-0687E - *In the Matter Of Advice No. 1814-Electric of Public Service Company of Colorado to Revise its Colorado P.U.C. No. 8 – Electric Tariff to Reflect a Modified Schedule RE-TOU and Related Tariff Changes to be Effective on Thirty-Days' Notice*
    - Designed and advocated for new data-based default time of use rate

Maryland Public Service Commission

- Case 9153, 9154, 9155, 9156, 9157, 9362 - *In the Matter Of Maryland Utility Efficiency, Conservation And Demand Response Programs Pursuant To The Empower Maryland Energy Efficiency Act Of 2008*
    - Multiple filings regarding the design and implementation of Maryland's energy efficiency portfolio standard

- Case 9271 - *In re the Merger of Exelon Corp. & Constellation Energy Grp., Inc.*
    - Analysis of renewable energy commitments in merger proposal

- Case 9311 - *In re the Application of Potomac Elec. Power Co. for an Increase in its Retail Rates for the Distrib. of Elec. Energy*
    - Supporting the implementation of a limited cost tracker to accelerate reliability investments after 2012 Derecho

- Case 9326 - *In re the Application of Balt. Gas & Elec. Co. for Adjustments to its Elec. & Gas Base Rates.*
    - Supporting the implementation of a limited cost tracker to accelerate reliability investments after 2012 Derecho

Maryland Public Service Commission (cont.)

- Case 9361 - *In re the Matter of the Merger of Exelon Corporation and Pepco Holdings, Inc.*
    - Policy analysis of merger proposal

Michigan Public Service Commission

- Case U-18419 – *In the matter of the application of DTE ELECTRIC COMPANY for approval of Certificates of Necessity pursuant to MCL 460.6s, as amended, in connection with the addition of a natural gas combined cycle generating facility to its generation fleet and for related accounting and ratemaking authorizations.*
    - Arguing against DTE Electric's proposal to construct a new natural gas combined cycle generating facility and instead meet its future capacity and energy needs with a distributed portfolio of solar, wind, energy efficiency, and demand response.
- Case U-20162 – *In the matter of the Application of DTE Electric Company for authority to increase its rates, amend its rate schedules and rules governing the distribution and supply of electric energy, and for miscellaneous accounting authority*
    - Arguing against DTE Electric's proposal for a net energy metering successor tariff that improperly undervalued the contribution of distributed solar.
- Case U-20165 - *In the matter of the application of Consumers Energy Company for approval of its integrated resource plan pursuant to MCL 460.6t and for other relief.*
    - Discussing Consumers Energy Company's integrated resource plan, arguing for advancing the deployment of solar to meet its capacity requirements, arguing against Consumers' proposed financial compensation mechanism for third-party PPA contracts, supporting a robust PURPA market, and supporting transparent and equitable competitive procurement guidelines.
- Case U-20471 - *In the matter of the Application of DTE Electric Company for approval of its integrated resource plan pursuant to MCL 460.6t, and for other relief.*
    - Evaluating DTE's integrated resource plan, arguing for the Company to modify its modeling assumptions for solar, analyzing the operation and reliability of DTE's aging peaker fleet, demonstrating that solar and solar plus storage could replace some of DTE's peakers, advocating for robust competition and third-party access to new resources.

Public Utility Commission of Nevada

- Docket Nos. 17-06003 & 17-06004 Phase III – Rate Design – *Application of Nevada Power Company d/b/a NV Energy for authority to adjust its annual revenue requirement for general rates charged to all classes of electric customers and for relief properly related thereto.*
    - Arguing against Nevada Power Company's proposal to increase fixed customer charge

Public Utility Commission of Texas

- Docket 46831 – *Application of El Paso Electric Company to change rates*
    - Critiquing El Paso Electric's proposal to implement a three-part rate for residential and small commercial net metered customers

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DIRECT TESTIMONY OF KEVIN LUCAS
ON BEHALF OF
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EXHIBIT KL-2

DUKE ENERGY CAROLINAS, LLC AND DUKE ENERGY PROGRESS, LLC

Request:

The following questions are for scenarios that utilize small modular reactors.

a) What operating mode (e.g. baseload, load following, peaker) does the Company assume the small modular reactors will follow?
b) How does the Company anticipate the operational characteristics (min operating levels, ramp rates, etc.) of the SMR units will compare to conventional resources such as combined cycle or combustion turbine models?
c) What is the first year that a SMR is assumed to be online? When must construction on the unit begin to meet this deadline?

Response:

a) The small modular reactors modeled in the IRP are described in Chapter 8: Screening of generation Alternatives, Appendix A: Quantitative Analysis, and Appendix G: Screening of Generation Alternatives as baseload resources. As discussed in the report, small modular nuclear can also offer flexibility to load follow, providing system benefits for addressing intermittency of variable energy resources while providing dispatchable, carbon-free, bulk energy.

b) The operational characteristics of the SMR is expected to be similar to conventional resources such as combined cycle or combustion turbines. The modular design with multiple reactors and individual steam cycles for each reactor provide the plant with operational flexibility and cycling options with fast ramping capabilities. These units are also designed to operate with lower online minimum load (as a percentage of full load) than CCs and CTs.

c) The earliest an SMR is modeled to come online in the IRP is the end of 2029 in the 70% system CO2 reduction with SMRs portfolio. SMRs modeled for the IRP have eight (8) year capital spend, with the first two (2) year primarily focused around licensing, and the final six (6) year being construction, testing, and commissioning. As stated in the IRP, the company recognizes the challenges with integrating a first of a kind technology in a relatively compressed timeframe are significant. Therefore, these cases are intended to illustrate the importance of advancing such

technologies as part of a blended approach that considers a range of carbon-free technologies to allow deeper carbon reductions.

Response Provider (name, title): Michael Quinto, Senior Engineer – Carolinas Resource Planning and Analytics
Documents Consulted (if any): n/a
This response is based on my personal knowledge.

DIRECT TESTIMONY OF KEVIN LUCAS
ON BEHALF OF
THE SOUTH CAROLINA SOLAR BUSINESS ALLIANCE

EXHIBIT KL-3

CONFIDENTIAL
Filed Under Seal

Docket Nos. 2019-224-E
and 2019-225-E

DIRECT TESTIMONY OF KEVIN LUCAS
ON BEHALF OF
THE SOUTH CAROLINA SOLAR BUSINESS ALLIANCE

EXHIBIT KL-4

DUKE ENERGY CAROLINAS, LLC AND DUKE ENERGY PROGRESS, LLC

Request:

Please refer to page 198 of the IRP Report.

a) What costs were assumed for firm interstate transportation service for natural gas?
b) How did these costs evolve over the IRP analysis period?
c) How did these costs compare to the original price estimate of ACP?
d) How did these costs compare to the latest available price estimate of ACP?
e) When does the Company plan to release the Portfolio Screening Tool?

Response:

The following response is based on my personal knowledge.

a) Firm interstate transportation service for natural gas was $1.45 per dekatherm for all new combined cycle units. No firm interstate transportation service for natural gas was assumed for CTs or at natural gas co-firing on coal unit.

b) Upon cancellation of ACP, the firm interstation transportation service for natural gas from that pipeline was removed as an option in the analysis.

c) ACP was cancelled prior to the filling of the IRP and therefore was not included in any of the development or analysis of the 2020 IRP.

d) ACP was cancelled prior to the filling of the IRP and therefore was not included in any of the development or analysis of the 2020 IRP.

Responsible Person(s) and/or Subject Matter Expert(s): Michael Quinto
Documents Consulted (if any): N/A

e) The tool was released on Friday, September 18, 2020. A link is available on the Company's IRP Reference Information Portal.

Responsible Person(s) and/or Subject Matter Expert(s): Nathan Gagnon
Documents Consulted (if any): None

Docket Nos. 2019-224-E
and 2019-225-E

DIRECT TESTIMONY OF KEVIN LUCAS
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EXHIBIT KL-5

DUKE ENERGY CAROLINAS, LLC AND DUKE ENERGY PROGRESS, LLC

Request:

Please refer to page 311 of the IRP Report. Does existing firm natural gas supply capacity that Duke plans to replace the ACP exist, or would Duke need to rely on new or upgraded pipeline capacity to increase its firm natural gas supply?

Response:

The following response is based on my personal knowledge.

There is no existing firm natural gas capacity available to replace ACP. Duke will rely on new or upgraded capacity to increase its firm natural gas transportation capacity.

Responsible Person(s) and/or Subject Matter Expert(s): Michael Quinto
Documents Consulted (if any): N/A

Docket Nos. 2019-224-E
and 2019-225-E

DIRECT TESTIMONY OF KEVIN LUCAS
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EXHIBIT KL-6

DUKE ENERGY CAROLINAS, LLC AND DUKE ENERGY PROGRESS, LLC

Request:

Discuss all ways in which the proposed Southeast Energy Exchange Market would impact the Duke's IRP assumptions, from an operational, reliability, resource adequacy, and resource planning perspective.

Response:

Since SEEM is a sub-hourly non-firm energy only market, SEEM is not expected to be foundational to future IRPs. SEEM will be one of many operational tools that can be used to assist with managing net demand ramping and excess energy periods to avoid solar curtailments as we integrate more solar resources into the Duke Energy systems.

Responsible Person(s) and/or Subject Matter Expert(s): Sammy Roberts, General Manager, Transmission Planning and Operations Strategy, Transmission & Fuels Strategy & Policy; Glen A. Snider, Dir IRP & Analytics, Integrated Systems & Operations Planning
Documents Consulted (if any): N/A

Docket Nos. 2019-224-E
and 2019-225-E

DIRECT TESTIMONY OF KEVIN LUCAS
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EXHIBIT KL-7

DUKE ENERGY CAROLINAS, LLC AND DUKE ENERGY PROGRESS, LLC

Request:

Please refer to Appendix H of the IRP Report. For each publicly available source of information that the Company reviewed related to battery costs, please indicate how the other sources of information differed from the Company's assumption on factors such as depth of discharge, software controls, HVAC and fire detection costs, roundtrip efficiency, degradation, and other factors that were considered in the Company's battery cost and operation assumptions.

Response:

Please see attached file, "NCSEA_DR3-14_BatteryCostComparison.xls" for a comparison of third party source to Duke battery inputs.

Responsible Person(s) with title and/or Subject Matter Expert(s): Matthew Kalemba
Documents consulted (if any): Source documents identified in attachment.

DIRECT TESTIMONY OF KEVIN LUCAS
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THE SOUTH CAROLINA SOLAR BUSINESS ALLIANCE

EXHIBIT KL-8

CONFIDENTIAL
Filed Under Seal

Docket Nos. 2019-224-E
and 2019-225-E

DIRECT TESTIMONY OF KEVIN LUCAS
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EXHIBIT KL-9

DUKE ENERGY CAROLINAS, LLC AND DUKE ENERGY PROGRESS, LLC

Request:

Did DEC and DEP include distributed energy resources in any of their modeled resource portfolios?

a. If yes, provide the forecast of distributed energy resources, by resource type, included in each portfolio.

   i. Provide any hourly shapes associated with these DERs.

   ii. Provide DEC and DEP's forecasts of the capital costs, operating costs, and transmission costs associated with each type of DER.

b. If not, explain why not.

Response:

Yes, the Company included rooftop solar, utility scale solar, utility scale battery storage, utility scale solar paired with storage, and onshore Carolinas wind generation.

a) See attached file "NCSEA DR7-7_DistributedResources.xls". Please note the file does not include projections for offshore wind or Oklahoma wind. For rooftop solar projections, please see response to NCCEBA 2-4. Rooftop solar projections were the same in each portfolio.
i. See attached file "NCSEA DR7-7_Profiles.xls" for hourly shapes of solar and wind resources included in the portfolios. See response to NCSEA 2-49a for rooftop solar profiles.
ii. Please see the confidential attachment "PSDR3-7 Confidential – IRP Generic Unit Summary DEC 2020.xls" in response to Public Staff DR3-7, specifically the "Navigant-CAR" tab which includes the capital and operating cost projections for solar, storage, and solar plus storage. The "RE and Storage" tab Column C includes the capital and operating costs for onshore wind energy, and the "Capital Cost

Forecast" tab includes forecast capital costs for onshore wind energy. For transmission costs that were included in the PVRR analysis for these resources, please see response to Public Staff DR 3-17. The Company does not include capital, operating or transmission costs for rooftop solar in the IRP.

b) N/A

Responsible Person: Matt Kalemba, Director, DET Planning & Forecasting

Documents consulted: attached

Docket Nos. 2019-224-E
and 2019-225-E

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EXHIBIT KL-10

DUKE ENERGY CAROLINAS, LLC AND DUKE ENERGY PROGRESS, LLC

Request:

Please refer to page 44 of the DEP 2020 Resource Adequacy Study. Was solar's 1% and 20% capacity credit for winter and summer reserve margin, respectively, based on the modeled generation of solar during winter peak hours, or was it independently assigned?

Response:

Astrapé and the Company relied on the 2018 Solar Capacity Value Study to determine the capacity credit assigned to solar (see attached). This study determined the capacity value of the winter and summer solar at different solar penetration levels.

To clarify, for the 2020 Resource Adequacy Studies, hourly profiles are modeled within SERVM and the winter capacity value of 1% is only reflected in reporting the reserve margin.

Responsible Person: Nick Wintermantel - Astrapé Consulting – Principal
Documents Consulted: 2018 Solar Capacity Value Study

Docket Nos. 2019-224-E
and 2019-225-E

DIRECT TESTIMONY OF KEVIN LUCAS
ON BEHALF OF
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EXHIBIT KL-11

DUKE ENERGY CAROLINAS, LLC AND DUKE ENERGY PROGRESS, LLC

Request:

Please refer to page 33-35 of the DEP 2020 Resource Adequacy Study.

a) What was the basis for the 40% fixed / 60% tracking ratio in the CPRE 1 and Future Solar categories?
b) What ratio of fixed to tracking is used for the Transition-Fixed resources? What was the basis of this choice?
c) Please provide the SAM files developed as part of this study.
d) Was any effort made to ensure that the solar generation and load profile in a given modeling run were from the same year? That is, did the random load profile have corresponding solar generation from the same weather year? If not, please explain why.
e) What ILR rating did the Company use for solar generation in its modeling for each of the various categories of solar resource (e.g. Transition, CPRE, Future Solar)?

Response:

a) The 60%/40% SAT/FT ratio was determined from the actual CPRE winning bids. Each of the projects was identified as to whether the configuration was single axis tracking or fixed tilt. The capacity associated with each configuration was then summed and compared to the total capacity. While the calculations were based on the CPRE tranche 1 data, the ratio was assumed to be applicable for future solar projects as well.

b) The Transition – Fixed resources are assumed to be 100% fixed tilt. This segment represents the existing capacity associated with standard PURPA contracts which are assumed to be fixed tilt configurations.

c) Please find the zipped file titled "DR NCSEA 3-5 SAM Files" which contains the requested data.

Docket Nos. 2019-224-E
and 2019-225-E

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EXHIBIT KL-12

DUKE ENERGY CAROLINAS, LLC AND DUKE ENERGY PROGRESS, LLC

Request:

Please refer to the IRP Report at page 40.

a) Please provide all analyses that support the interconnection limit of 300 MW per year of solar and solar coupled with storage.
b) Absent this artificial limitation, what amount of solar would have been added in the capacity expansion modeling under the various scenarios?
c) Does the 300 MW per year interconnection limitation apply to the baseline assumption of solar (from 966 MW in 2021 to 3,494 MW in 2035), or does it only apply to new solar selected in the capacity expansion modeling process?
d) Does the 300 MW per year limitation include both solar and storage capacity? For example, if a 100 MW solar project were coupled with a 50 MW battery, would that consume 100 MW or 150 MW of the annual limit?
e) Please provide all analyses that support the limitation of 150 MW of onshore Carolinas wind generation.
f) Absent this artificial limitation, what amount of onshore wind would have been added in capacity expansion modeling under the various scenarios?
g) Confirm whether the MW limitations above are based on MW AC or MW DC. If MW DC, please provide the inverter load rating assumed for solar installations.

Response:

a) Please see the attached file NCSEA_E-100_Sub165_DR2-18A.xlsx. The average interconnection rate for 2014 – 2019 was 527 MW for DEC + DEP with a high of 744 MW in 2017 and a low of 267 MW in 2019. Given the lower penetration of solar in DEC vs DEP, and the significantly higher requests for bids in DEC in CPRE Tranches 1 & 2, the assumption was made to split the constraint to 300 MW in DEC and 200 MW in DEP to allow for increased solar growth in DEC. While the above represent physical constraints, the Company did not include an escalating SISC charge on increasing penetrations of solar or solar + storage nor did the Company include any system upgrade costs for interconnecting increasing levels of solar or solar + storage as penalties in the capacity expansion planning process. Finally, while not an issue through 2030, the same resources that are required for interconnecting this solar generation will also be needed for interconnecting up to 300 MW/year of onshore Carolinas wind between DEC and DEP in the later portion of the planning horizon.

b) As part of the high renewable sensitivity, the Company increased the interconnection limit from 500 MW to 900 MW (300 MW to 500 MW in DEC). Additionally, in that sensitivity, beginning in 2026 the Company input into the model additional solar MWs. In this case, the model did not select any additional solar until 2026 (versus 2024 in the base renewable case), and the model selected fewer MW of solar due to the amount of forced in solar. In total (model selected + model input solar), the high case included nearly 1,600 MW of additional solar versus the base case, or an additional 130 MW/year interconnected from 2024 through 2035. Similar to response (a), this sensitivity did not include an escalating SISC charge on increasing penetrations of solar or solar + storage nor did the Company include any system upgrade costs for interconnecting increasing levels of solar or solar + storage as penalties in the capacity expansion planning process. See file "NCSEA_E-100_Sub165_DR2-18B.xlsx" for a comparison of the two cases.

c) The constraint is a total interconnection constraint and includes model selected solar and model input solar.

d) The constraint only applies to the solar (A/C output) of the solar + storage facility. In the example provided, only 100 MW would be attributed to the annual limit.

e) The Company believes that given the nascent state of wind in the Carolinas, 150 MW per year in each jurisdiction (300 MW/year total) is a reasonable assumption. Additionally, per cleangridalliance.org, Midwest states like Indiana and Illinois that generally have a wider dispersion of fair wind resource potential versus the Carolinas have connected similar amounts since 2010. In years where these states have actually interconnected wind, interconnections have averaged 470 MW in Illinois and 229 MW in Indiana annually between 2010 and 2018 and in all years, including years without any interconnections, they have averaged 370 MW and 150 MW respectively. See file "NCSEA_E-100_Sub165_DR2-18E.xls" for annual interconnections and "blogs.edf.org/texascleanairmatters/files/2014/07/US-Wind-Map.png" for Wind Resource Potential map.

f) The Company did not evaluate the potential additional capacity for onshore wind beyond 300 MW/year (150 MW/year DEC) if this limitation were lifted.

g) The limitations are based on MW AC.

Responsible Person(s) and/or Subject Matter Expert(s): Matthew Kalemba, Dir DER Planning & Forecasting; Bryan Dougherty, Lead Wholesale Renewable Analyst, DER Planning and Forecasting
Documents Consulted (if any): attached

Docket Nos. 2019-224-E
and 2019-225-E

DIRECT TESTIMONY OF KEVIN LUCAS
ON BEHALF OF
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EXHIBIT KL-13

DUKE ENERGY CAROLINAS, LLC AND DUKE ENERGY PROGRESS, LLC (DEP)

Request:

For both Companies, please provide support for the six selected portfolios in a format similar to the Load, Capacity, and Resource Tables contained in DEC's response to Item 14 of Public Staff Data Request No. 2 from the 2016 IRP. This response should include a brief description of any resources that were artificially or not optimally selected by the model.

Response:

Load, Capacity and Reserves (LCR) tables are not developed for all portfolios. An LCR table is only produced for the "Base Case" presented in the IRP documents. However, provided in this response are the expansion plans and resulting reserve margins developed from the System Optimizer (SO) model. Please see attached file, "PSDR 3-14_SO Exp Plan - Exp Plan Summary w Nameplate - Final Portfolios.xlsx" for this information.

In all portfolios, solar and solar+storage was artificially added that represents both designated and mandated solar. Additionally, some undesignated solar, representing opportunities under SC Act 62 and assumptions regarding materialization of projects from the T&D queues, was also included in each portfolio.

In portfolios D, E and F a least cost planning solution was not being modelled but rather incorporation of additional carbon free resources to illustrate the required resources to achieve reduction levels or provide reliable energy in without new gas additions. This was achieved by artificially adding Central US Wind and other emerging resources such as off-shore wind and SMRs iteratively until those system requirement were met.

Responsible person (name, title): Jennifer. Canipe, P.E., Lead Engineer, Resource Planning & Analytics – Carolinas
Michael Quinto, Senior Engineer – Carolinas IRP and Analytics

Docket Nos. 2019-224-E
and 2019-225-E

DIRECT TESTIMONY OF KEVIN LUCAS
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EXHIBIT KL-14

DUKE ENERGY CAROLINAS, LLC AND DUKE ENERGY PROGRESS, LLC

Request:

For each of the modeled portfolios, confirm that System Optimizer was used in capacity expansion mode to optimize the resource build.

a. If not, identify the portfolios in which System Optimizer was not used in capacity expansion mode.

b. Identify the future resources hard-coded in the System Optimizer model in those portfolios.

Response:

System Optimizer was used to determine the most economic timing, capacity, and type of new units for portfolios A, B, and C.

In portfolios D, E, and F s, offshore wind, and pump storage were not eligible for selection in the modeling process, so those resources were added manually after optimization of other resources such as solar, onshore wind, and CCs and CTs.

This was discussed in detail in Appendix A of the IRP as well as in the responses to ORS AIR 2-9 and NCSEA DR2-39.

Responsible Person: Thomas Beatty, Engineer III, Carolinas IRP and Analytics

Documents consulted: N/A

DIRECT TESTIMONY OF KEVIN LUCAS
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EXHIBIT KL-15

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DIRECT TESTIMONY OF KEVIN LUCAS
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EXHIBIT KL-16

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Docket Nos. 2019-224-E
and 2019-225-E

DIRECT TESTIMONY OF KEVIN LUCAS
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EXHIBIT KL-17

DUKE ENERGY CAROLINAS, LLC AND DUKE ENERGY PROGRESS, LLC

Request:

Please refer to page 158 of the IRP Report. Please provide the statistical analysis that was used to develop the 10th and 90th percentile of natural gas prices.

Response:

The scenarios are generated using the following method:

• The Henry Hub NYMEX natural gas forward curve was simulated using a standard Geometric Brownian Motion model. The market settlement curve (source: Morningstar) and implied volatility curve (source: ICE) for valuation date 4/9/2020 were used to calibrate simulated price averages and volatilities. The correlations between monthly contracts were calibrated to historical correlations between forward contract daily returns for 1 year prior to the valuation date.

• The model was used to create 1000 iterations of future natural gas price curve simulations from 2020 through 2032. The iterations were sorted by average price over the simulation time period. Iterations 95 through 105 were averaged to estimate a low price case (10th percentile), and iterations 895 through 905 were averaged to estimate the high price case (90th percentile).

• The above procedure was repeated 10 times (10,000 total simulations), and the high cases and low cases calculated in each run were averaged to get more reliable estimates of the 10th and 90th percentile.

• The monthly scenario curves were extended to 2035 by compounding the year-over-year growth from the last year of market data.

• Annual averages were calculated from the high and low monthly simulated market scenarios and these were blended with high and low fundamental price curves to create the final curve shown.

Responsible Person(s) and/or Subject Matter Expert(s): Ameya Deoras, Lead Quantitative Analyst, Fuel, Fleet Analytics
Documents Consulted (if any): N/A

Docket Nos. 2019-224-E
and 2019-225-E

DIRECT TESTIMONY OF KEVIN LUCAS
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EXHIBIT KL-18

DUKE ENERGY CAROLINAS, LLC AND DUKE ENERGY PROGRESS, LLC

Request:

Please provide all peak load forecasts (winter and summer) and energy forecasts that were created between 2010 to 2020. Also provide the actual and weather normalized peak for the years 2010 through 2020.

Response:

Response: Please see file NCSEA DR3-12 attachment.xlsx in the attached zipped folder.

Responsible Person(s) with title and/or Subject Matter Expert(s): Jeff Day, Lead Load Forecaster
Documents consulted (if any): N/A

DIRECT TESTIMONY OF KEVIN LUCAS
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EXHIBIT KL-19

CONFIDENTIAL
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DIRECT TESTIMONY OF KEVIN LUCAS
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EXHIBIT KL-20

DUKE ENERGY CAROLINAS, LLC AND DUKE ENERGY PROGRESS, LLC

Request:

Please refer to the IRP Report at page 29. Does the Company currently collaborate and share capacity between DEC and DEP? If so, please provide details of the scope of the collaboration. If not, please explain why.

Response:

The Companies currently operate under a Joint Dispatch Agreement, as filed initially in Docket Nos. E-2, Sub 998 and E-7, Sub 986 on April 4, 2011.

Capacity transfers between DEC and DEP are limited by the Joint Dispatch Agreement. Outside of emergency reserve transfers, DEC and DEP can only transfer economic energy between the two BAs in accordance with the Joint Dispatch Agreement. Long term capacity sharing is not allowed under the agreement and such an arrangement would involve state and federal regulatory approvals. See, e.g., the NCUC's Regulatory Conditions and Code of Conduct. As such, the Companies do not share capacity between the DEC and DEP BAs in the IRP portfolios analyzed.

Responsible Person(s) and/or Subject Matter Expert(s): Jennifer Canipe, P.E., Lead Engineer, Resource Planning & Analytics – Carolinas
Documents Consulted (if any): See attached Joint Dispatch Agreement in attached zipped folder and also response to DR2-37.

Docket Nos. 2019-224-E
and 2019-225-E

DIRECT TESTIMONY OF KEVIN LUCAS
ON BEHALF OF
THE SOUTH CAROLINA SOLAR BUSINESS ALLIANCE

EXHIBIT KL-21

DUKE ENERGY CAROLINAS, LLC AND DUKE ENERGY PROGRESS, LLC

Request:

Please refer to the IRP Report at page 29. Has Duke considered merging or aligning the IRP process between DEC and DEP to produce a unified IRP that covers both territories? If so, please provide details of the process. If not, please explain why, including whether there are regulatory or statutory barriers that would prevent the Company from doing so.

Response:

Please see the response to NCSEA DR2-12. In addition, DEC and DEP are individual utilities that have separate balancing areas across NC and SC. The utilities are required to file individual IRPs by NCUC rule. A shared long-term capacity arrangement between DEC and DEP would require FERC, NCUC and PSCSC approval.

Responsible Person(s) and/or Subject Matter Expert(s): Jennifer Canipe, P.E., Lead Engineer, Resource Planning & Analytics – Carolinas
Documents Consulted (if any): N/A

Docket Nos. 2019-224-E
and 2019-225-E

DIRECT TESTIMONY OF KEVIN LUCAS
ON BEHALF OF
THE SOUTH CAROLINA SOLAR BUSINESS ALLIANCE

EXHIBIT KL-22

DUKE ENERGY CAROLINAS, LLC AND DUKE ENERGY PROGRESS, LLC

Request:

Please refer to the Company's response to NCSEA DR2-13. Has the Company considered pursuing approval from FERC, NCUC, and PSCSC to allow the Company to file a unified IRP that covers both territories or to merge the balancing areas across NC and SC? If so, please discuss the status of the effort. If not, please explain why it has not done so.

Response:

The Company objects to this request to the extent that it seeks information protected by the attorney/client privilege or the attorney work-product doctrine. Without waiving this objection, the Company further responds that it routinely considers various regulatory strategies that could benefit customers. The Companies further note that they already file a joint planning scenario in the IRPs. If and when a decision were to be made to file a unified IRP that covers both territories or to merge the balancing areas across NC and SC, the Company would seek appropriate regulatory approvals.

Responsible Person (name, title): Bo Somers, Deputy General Counsel
Documents Consulted (if any): None